Semple, J.C. 2013. On the name *Solidago mirabilis* (Asteraceae: Astereae) and a new name for a Japanese species of goldenrod. Phytoneuron 2013-24: 1–9. Published 2 April 2013. ISSN 2153 733X

ON THE NAME *SOLIDAGO MIRABILIS* (ASTERACEAE: ASTEREAE) AND A NEW NAME FOR A JAPANESE SPECIES OF GOLDENROD

JOHN C. SEMPLE
Department of Biology
University of Waterloo
Waterloo, Ontario Canada N2L 3G1
jcsemple@uwaterloo.ca

ABSTRACT

A new name is needed for the Japanese species identified as *Solidago mirabilis* Kitam. because the name is a later homonym of the North American *Solidago mirabilis* Small. Morphological features of **Solidago nipponica** Semple, **sp. nov.**, with a new type and description, are discussed and compared with other species in *Solidago* subsect. *Solidago*.

KEY WORDS: *Solidago mirabilis*, *Solidago nipponica*, *Solidago decurrens*, *Solidago dahurica*, *Solidago virgaurea*, *Solidago pacifica*, *Solidago* subsect. *Solidago*

Solidago mirabilis Small was published in 1933. In 1985, Uttal annotated the holotype (*Small & Mosier s.n.*, NY!) as *S. latissimifolia* Mill., a species native to coastal eastern North America. Uttal and Porter (1988) placed Small's name in synonymy under *S. latissimifolia*, as did Semple and Cook (2006). The homonym *Solidago mirabilis* Kitamura (Acta Phytotax. Geobot. 3: 140. 1934) was published after the Small name and was applied to a species native to Japan. *Solidago virga-aurea* L. var. *gigantea* Nakai (Tokyo Bot. Mag. 62: 17. 1928) is a synonym of the Kitamura taxon, but the varietal epithet cannot be used as the basis for a species-rank name, which is already occupied by *Solidago gigantea* Ait. (Hort. Kew. 3: 211. 1789). The species was treated as *S. virgaurea* var. *gigantea* in the Flora of Japan (Iwatsuki et al. 1995).

In a taxonomic revision of the whole genus (Semple in prep.), the Asian plants previously identified as *Solidago mirabilis* and *S. virgaurea* var. *gigantea* will be treated as a distinct species. A new type and description are provided here in conjunction with a new name at that rank.

SOLIDAGO NIPPONICA Semple, **sp. nov. TYPE**: **JAPAN. Honshu. Akita Pref.**: Oga city, Motoyama, 140 m elev., 21 Sep 1997, *Yojiro Horii 1524* (holotype: KYO!). Figures 1 and 2.

Similar to *Solidago decurrens* but the cauline leaf blades ovate-lanceolate and truncate and the inflorescence usually corymbiform.

Plants 21–**53**–110 cm tall; caudices short thick-branched. **Stems** 1–5, erect, tufted, proximally glabrous or sparsely hairy, densely short-hispido-strigose in inflorescence. **Leaves**: basal and proximal cauline petiolate; petioles winged and sometimes slightly auriculate clasping; blades lanceolate to ovate, 20–**101**–191 × 16–**36**–70 mm, bases of proximal leaves truncate, coarsely serrate to crenate near apices, attenuate, margins ciliate; mid cauline petiolate, 30–**75**–130 × 14–**30**–65 mm, blades lanceolate to ovate, broadly winged distally; distal cauline sessile or petioles broadly winged distally; blades sometimes slightly subclasping stems, lanceolate, 16–**52**–125 × 5–**19**–50 mm, bases tapering to truncate, margins often distinctly ciliate. **Heads** 4–75(–100+), not secund, in usually dense, round-topped corymbiform inflorescences, sometimes narrowly paniculiform or with lower branches spreading and elongated. **Peduncles** 5–6 mm, villous-strigose; bracteoles 0–2, linear-lanceolate to lanceolate. **Involucres** 3.1–**4.6**–6.1 mm. **Phyllaries** in 3-5 series; outer ovate, 1.5-2.5 mm, margins ciliate, apices acute; mid lanceolate, acute to attenuate. **Ray florets** 3–**6**–9; laminae

1.9–**3.1**–5.2 × 0.6–**1.3**–2.1 mm. **Disc florets** 6–**10**–19; corollas 3.4–**4.9**–6.8 mm, lobes 0.4–**0.8**–1.7 mm. **Cypselae** 2–3.5 mm, very sparsely to moderately strigose; **pappi** 3–4.5 mm (inner most bristles somewhat clavate). ***2n*** = 18, see below. [Ranges are given as minimum–**mean**–maximum.]

Figure 1. Holotype of *Solidago nipponica*, *Y. Horii 1524* (KYO).

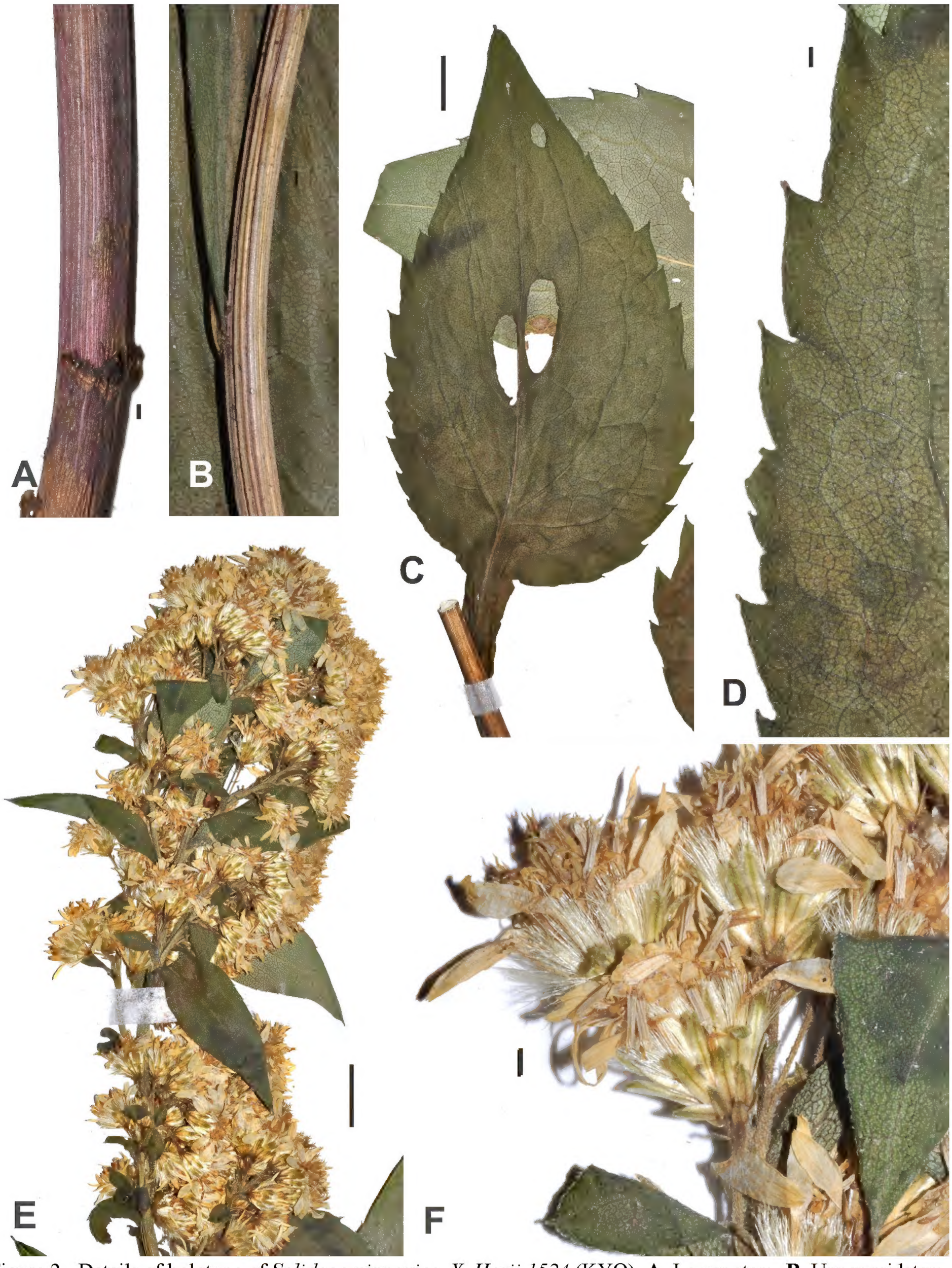

Figure 2. Details of holotype of *Solidago nipponica*, *Y. Horii 1524* (KYO). **A.** Lower stem. **B.** Upper midstem. **C.** Lower stem leaf. **D.** Lower stem leaf margin. **E.** Inflorescence. **F.** Heads. Scale bar = 1 mm in A, B, D and E; = 1 cm in C and E.

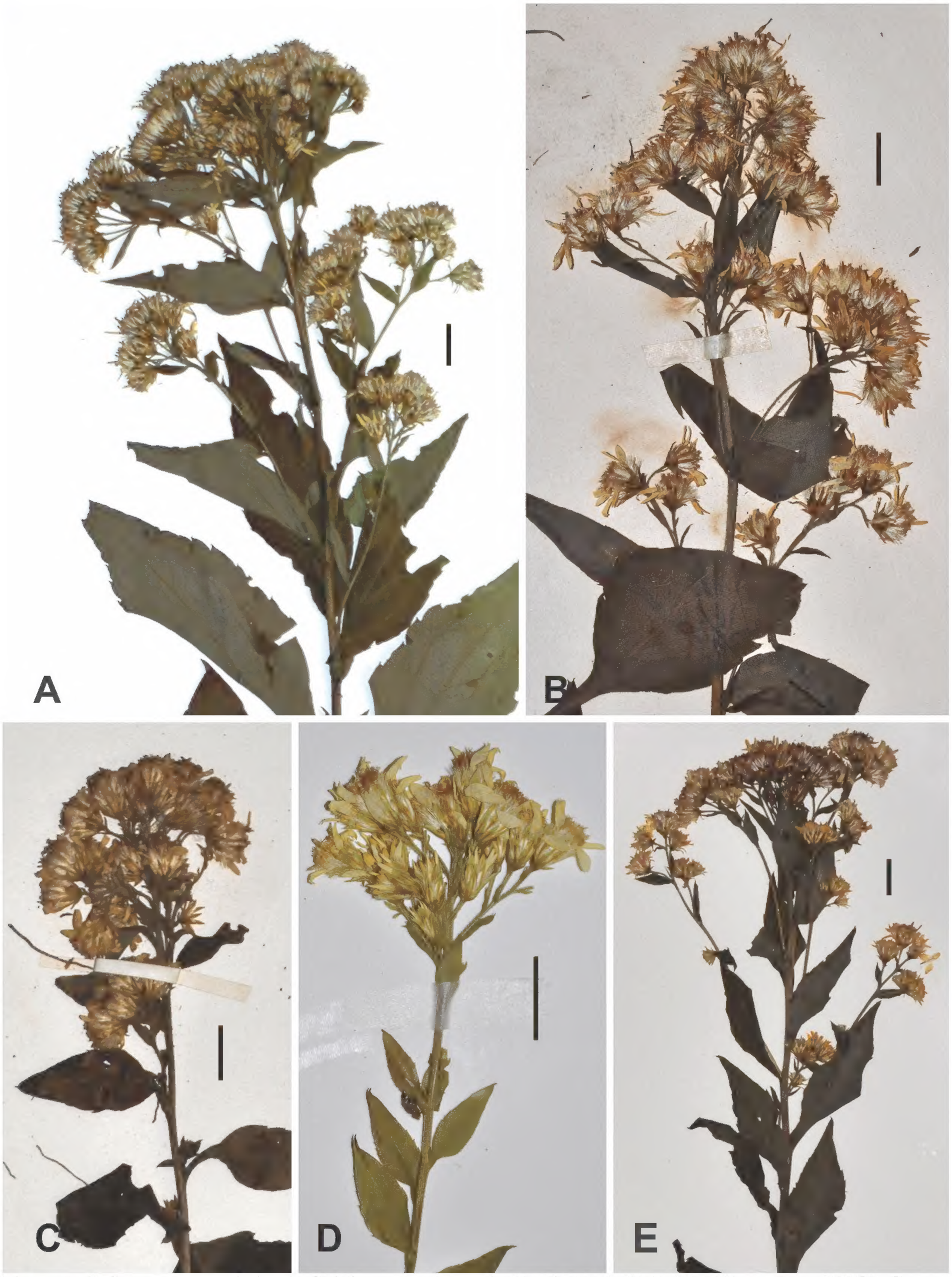

Figure 3. Inflorescence variation in *Solidago nipponica*. **A.** *Kondo 2331* (WAT). **B.** *Hiroe 6808* (KYO). **C.** *Kitamura s.n.* (KYO). **D.** *Yonekura 12919* (KYO). **E.** *Deguchi 5530* (AA). Scale bars = 1 cm.

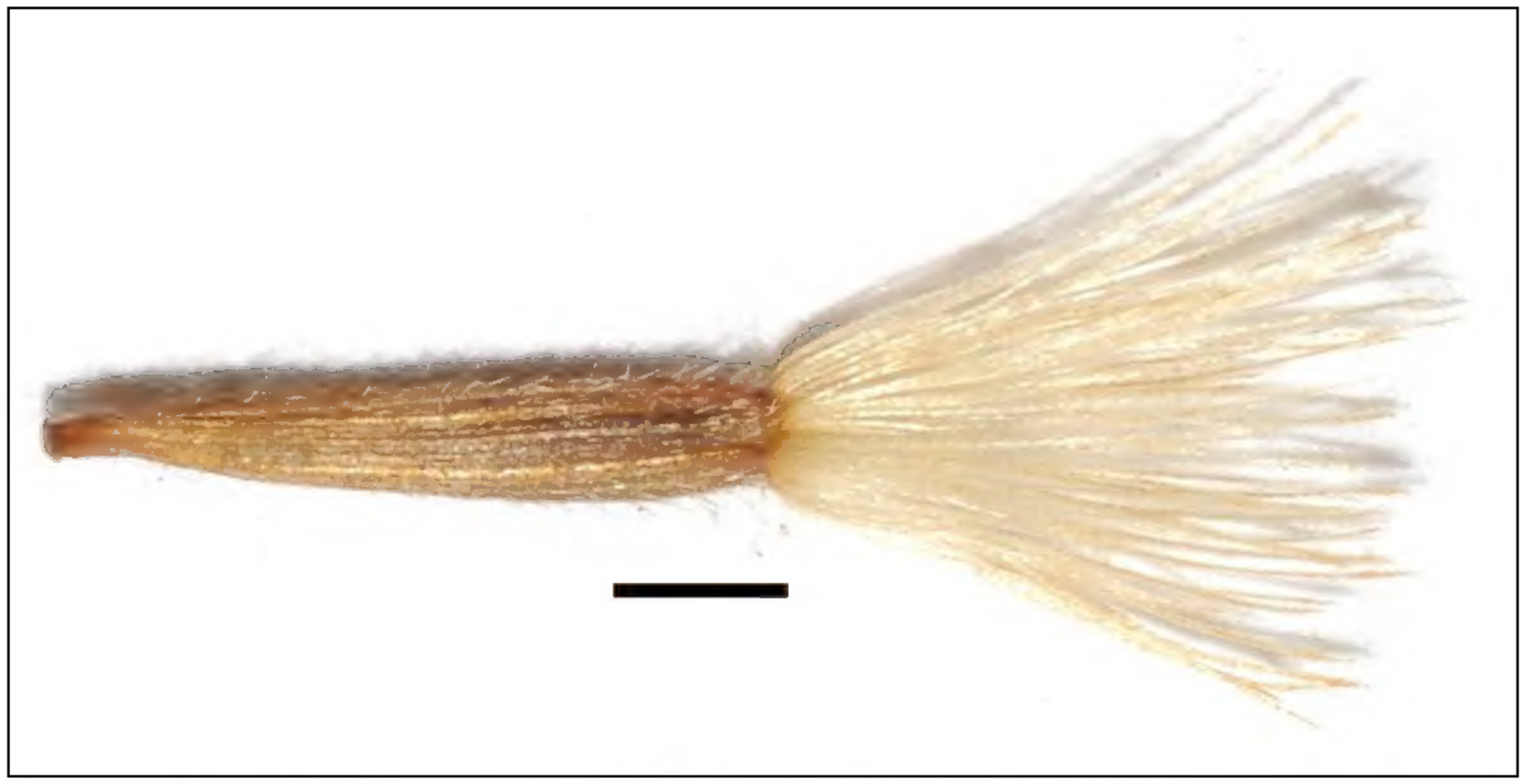

Figure 4. Disc floret cypsela of *Solidago nipponica, Kitamura s.n.* (KYO); scale bar = 1 mm.

Flowering: August-September.

Distribution (Fig. 5): Japan: central to northwestern Honshu Is., Hokkaido Is., and adjacent small islands. Rare and now threatened.

The Japanese Goldenrod can be a very showy plant. It is now very rare in northern Japan. Photographs are posted online (Prof. Summer's Web Garden 2013; see synonyms *S. virgaurea* subsp. *gigantea* and *S. virgaurea* subsp. *leiocarpa* var. *praeflorens*).

Specimens examined. JAPAN. **Hokkaido**. **Hokkaido Pref.**: Abuta, Rebunge, Oct 1935, *Kitamura s.n.* (KYO); Hidaka Prov., Shizunai-gun (Dist.), en route from base of Mt. Petekari-sanso, 29 Jul 1970, *Koyama & Fukuoka 3377* (KYO); Iburi, at the foot of Mt. Bozuyama, Hobetsu-cho, Yuhutsu-gun, on stony waste of serpentine rocks, 200 m elev., 29 June 1978, *Murata 37269* (GH); Yufutsu-gun, Symukapu-mura, between Akaiwa and Cyuou, 24 Aug 1951, *Hiroe 6808* (KYO); Ishikari Yezo Prov., Nokogiri-dake, Mt. Ashibetsu-dake Yamabe-mura Sorachi-gun, by alpine field, 15-600 m elev., 28 Jul 1957, *Miyoshi Furuse* (A); Kameda-gun, Nanae-cho, en route from Mt. Yokotsu-dake to Oonakyama, 300-800 m elev., 7 Sep 1974, *Kurosaki 6427* (KYO); Mt. Yokotsu-dake, Oshima-shicho, open grass fields, 900-1167 m elev., 7 Sep 1974, *Kurosaki 6416* (KYO); Kitami Prov., Syari-take, Shari-gun, 12 Sep 1950, *without name 847* (KYO); Oshima Prov., Hakodate, Sep 1935, *Kitamura s.n.* (KYO); Shiribeshi Prov., Setana, 13 Oct 1935, *Kitamura s.n.* (KYO); Sapporo, 8/9/1892, *Jokuluchi s.n.* (MO); Aug 1880, *Sapporo Agricultural College s.n.* (GH); Tomakomai-shi, Lake Utonai-ko, 23 Sep 1994, *Kobayashi 2779* (A). **Honshu**. **Aomori Pref.**: Aomori-shi, Minami-Hakkoda Mts., Takadayachi Moor, in *Sphagnum* moor, 1020-1030 m elev., 17 Aug 2005, *Yonekura 12919* (KYO); Nakatasugaru-gun, Iwaki-cho, en route from the summit of Mt. Iwaki to the shrine of Iwakisan, in light depression, 1600 m elev., 24 Aug 1970, *Fujita s.n.* (KYO); Nishi-Tsugaru-gun, Fukaura Machi, W foot of Mt. Shirakami-yama, growing in groups at weeedy place near beach, 10 m elev., 19 Oct 1997, *Konta 19657* (A). **Ishikawa Pref.**: Mt. Hakusan (Mt. Hausan Nat. Pk., resting volcano, 2000 m elev., 31 Aug 1994, *Kondo 2333* (WAT); **Miyagi pref.**:, Katta-gun, Zao-machi, Awashima-jinjia, 30 Sep 1996, *Yamaguchi 683* (A). **Niigata Pref.**: Sado Prov., Sado Is., Kanaizumi-mura, 9 Aug 1953, *Murata 6484* (KYO). **Yamagata Pref.**: en route from Namekawa-onsen to Kugurino-taki, Yonezawa-city, 900 m elev., 17 Aug 1962, *Koyama 1329* (KYO).

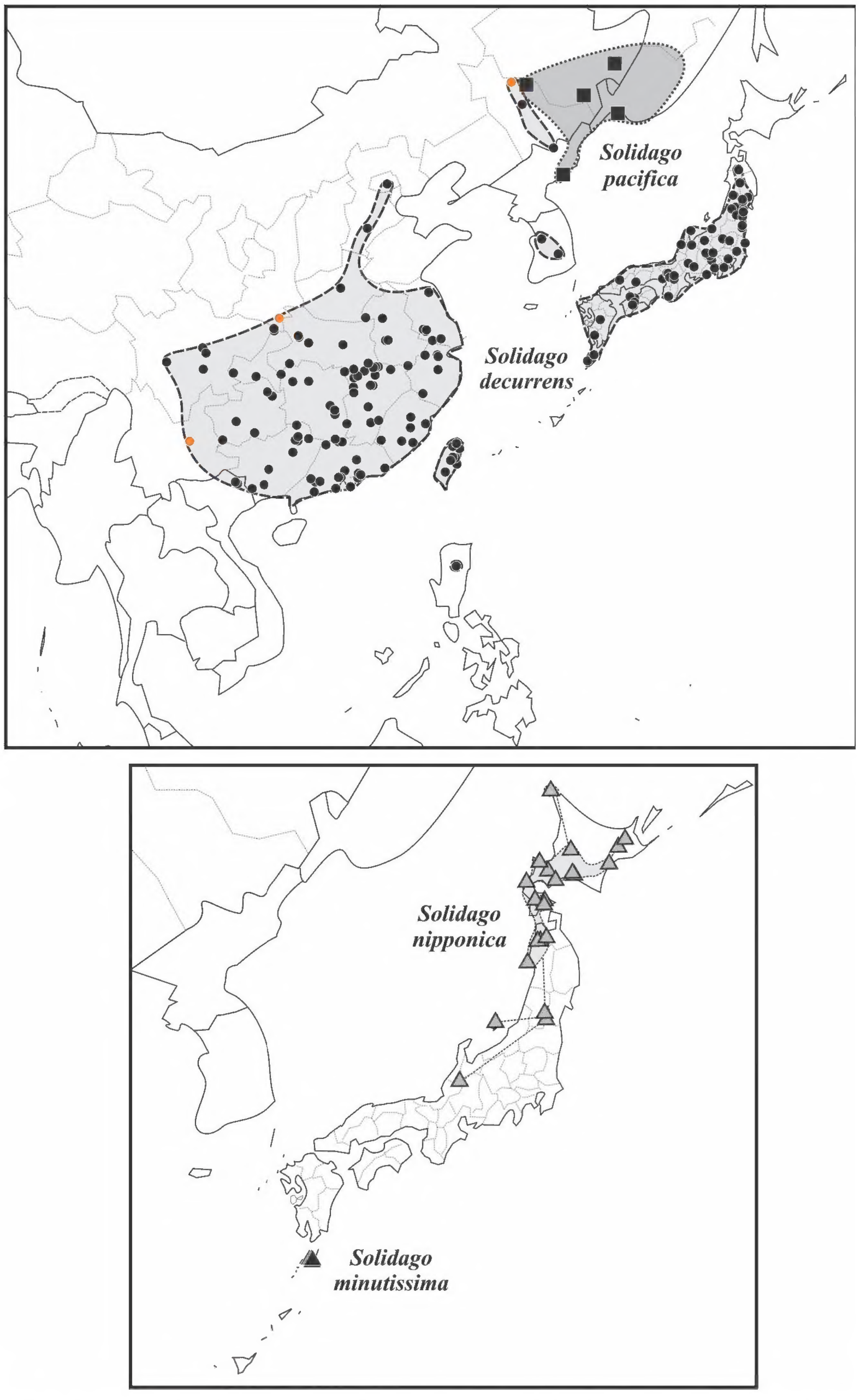

Figure 5. Distribution of *Solidago nipponica* in Japan and related species in eastern Asia based on all collections seen. Some portions of China were not well represented in the collections seen and this may account for the sparsity of dots for *S. decurrens* in northeastern China; orange dots = location in province uncertain.

The Japanese Goldenrod *Solidago nipponica* is the most robust native species in Japan. Even the smaller specimens seen had the distinct truncate lower stem leaves and the corymbiform arranged of heads. The species is similar to more robust *S. decurrens* Loureiro, which has lower stem leaves that are lanceolate or narrowly lanceolate with tapering bases. The inflorescence of *S. decurrens* is usually narrowly paniculiform and never broadly corymbiform. *Solidago decurrens* is much more common in much of Japan and southern and eastern China, and it is present on the Korean Peninsula (Fig. 5). The ranges of the two species overlap in westcentral and northern Honshu Island.

In contrast to *Solidago nipponica* and *S. decurrens* is the dwarf *S. minutissima* (Makino) Kitamura, found only on Yakushima Island at higher elevations (Fig. 5). The entire plant is usually only a few centimeters tall. *Solidago pacifica* Juz. is similar to *S. decurrens* in leaf and inflorescence shape but is more robust and has oblong phyllaries with rounded apices rather than lanceoate phyllaries with acute tips typical of other species in subsect. *Solidago*. It occurs in northeastern China, the Korean Peninsula, and in Russia near Vladivostok (Fig. 5). Very few collections of this latter species have been seen, limiting conclusions.

There are two more widely distributed species of subsect. *Solidago* that are not likely to be confused with *S. nipponica*. *Solidago virgaurea* L. is native to much of Europe; I have seen no collections east of the southern Ural mountains but the species does occur in Pakistan and India in the Himalayas. *Solidago dahurica* (Kitag.) Juz. occurs from Uzbekistan across Russia to Kamtschatka and south to Pakistan and India in the Himalayas and south to northeastern China. As delimited here, *S. virgaurea* has ovaries that are very sparsely to densely hairy over the entire surface, while ovaries of *S. dahurica* are sparsely hairy only on the distal surfaces. *Solidago virgaurea* has been reported from much further east than noted here, but I have not seen any collections confirming this.

Key to species of *Solidago* in Japan

1. Inflorescence secund-pyramidal (introduced species; native to North America)
   2. Stems glabrous proximally to glabrous or sparsely strigose distally; upper stem leaves glabrous to sparsely strigose, obviously serrate; tetraploid ..... **Solidago gigantea**
   2. Stems moderately to densely short strigose; upper stem leaves strigose, entire or with only a few very small serrations; hexaploid ..... **Solidago altissima**
1. Inflorescence narrow to broadly club- or wand-shaped or rounded- to flat-topped (native species)
   3. Plants very small, 2–10 cm tall; Yakushima ..... **Solidago minutissima**
   3. Plants taller, 20–110 cm tall; much of Japan
      4. Leaves lanceoate to linear lanceolate, proximal tapering; inflorescence never rounded flat-topped; central and southern Japan ..... **Solidago decurrens**
      4. Leaves ovate to lanceolate, proximal and often distal truncate; inflorescence often rounded flat-topped (corymbiform); northwestern Honshu, Hokkaido ..... **Solidago nipponica**

Chromosome number of *S. nipponica*

Two chromosome number reports of $2n = 18$ are listed in Watanabe's (2013) online data on chromosome numbers in the Asteraceae that may be reports for *Solidago nipponica*. Nishikawa (1979, 1988) reported two counts under the name *S. virgaurea* var. *leiocarpa* from Hokkaido. These are likely to be for *S. nipponica* based on provenence, although the vouchers have not been seen in this study Several other reports for plants from central to northern Honshu are also diploid and maybe for *S. nipponica* but cannot be assigned until vouchers are seen. All 115 chromosome number reports for the *S. virgaurea* complex across Eurasia are diploid (Watanabe 2013; Semple unpublished counts).

ACKNOWLEDGEMENTS

This work was supported by Natural Sciences and Engineering Research Council of Canada Discovery Grants to the author. Joan Venn is thanked for her curatorial assistance with loans and WAT collections. The following herbaria are thanked for loaning specimens of *Solidago* subsect. *Solidago*: A, GH, KYO, and MO. Kuniaki Watanabe is thanked for the translation of Japanese text on the holotype herbarium label. The following students assisted in recording location data and collecting morphological data on specimens of subsect. *Solidago*: Yunfei Ma, Marion Sorour, and Lan Tong.

LITERATURE CITED

Cronquist, A. 1980. Vascular Flora of the Southeastern United States. I. Asteraceae. Univ. North Carolina Press, Chapel Hill.

Iwatsuki, K., T. Yamazaki, D.E. Boufford, and H. Ohba (eds.). 1995. Flora of Japan, Vol. IIIb: Angiospermae, Dicotyledoneae, Sympetalae (b). Tokyo: Kodansha, Ltd.

Kitamura, S. 1934. Compositae Novae Japonicae VIII. Acta Phytotax. Geobot. 3: 128–145.

Nishikawa, T. 1979. Chromosome counts of flowering plants of Hokkaido (2). Rep. Taisetsuzan Inst. Sci. 14: 15–23.

Nishikawa, T. 1988. Chromosome counts of flowering plants of Hokkaido (11). J. Hokkaido Univ. Educ. Sect. 2B 38: 33–40.

Prof. Summer's Web Garden. 2013. Prof. Summer's Web Garden. <http://flowers.la.coocan.jp/> Japanese Wild Flowers. <http://www7a.biglobe.ne.jp/~flower_world/>

Semple, J.C. and R.E. Cook. 2006. *Solidago* Linnaeus. Pp. 107–166, *in* Flora North America Editorial Committee (eds.). Flora of North America. Vol. 20. Asteraceae, Part 2. Astereae and Senecioneae. Oxford Univ. Press, New York.

Small, J.K. 1933. Manual of the Southeastern Flora. Univ. of North Carolina Press, Chapel Hill.

Thiers, B. [continuously updated]. Index Herbariorum: A global directory of public herbaria and associated staff. Virtual Herbarium, New York Botanical Garden. http://sciweb.nybg.org/science2/IndexHerbariorum.asp

Uttal, L.J. and D.M. Porter. 1988. The correct name for Elliott's goldenrod. Rhodora 90: 157-168.

Watanabe, K. 2013. Index to chromosome numbers in Asteraceae. Kobe University Library Digital Archive. <http://www.lib.kobe-u.ac.jp/infolib/meta_pub/G0000003asteraceae_e>